File : FIPS

UNITED STATES DEPARTMENT OF COMMERCE
National Bureau of Standards
Washington, D.C. 20234

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1976 September 13

Copy to ADP Central
Meeting on 9/29.

MEMORANDUM FOR FIPS Points of Contact
FIPSCAC

From: Harry S. White, Jr.
        Associate Director
        Office of ADP Standards Management

Subject: Approved Federal Standard COBOL Interpretation No. 1,
           The COMPUTE Statement

Enclosed is the approved interpretation of the COMPUTE statement in
Federal Standard COBOL. This approved interpretation, on the
effective date, becomes an integral part of Federal Standard COBOL
and, as such, is considered to be included whenever a reference is
made to Federal Standard COBOL. The effective date will be 30 days
from the date the approved interpretation is published in the
Federal Register.

Enclosure
        As Stated

cc: State Information Systems Coordinators

FEDERAL STANDARD COBOL
INTERPRETATION

SUBJECT: The COMPUTE Statement

INTERPRETATION NO: 1

EXPLANATION: Under the provisions of Public Law 89-306 and Executive
Order 11717, the Secretary of Commerce is authorized to establish uniform
Federal ADP Standards. FIPS PUB 21-1 specifies Federal Standard COBOL.
The Standard defines the elements of the COBOL Programming Language and
the rules for their use. During the use of the standard, questions arise
as to the meaning of certain language specifications. FIPS PUB 29 defines
the procedures to be followed in providing solutions to these questions.
The procedures allow for the solutions to be used uniformly throughout
the Federal Government and by all implementors of compilers acquired by the
Federal Government. Accordingly, in the January 15, 1976 issue of the
Federal Register (FR Doc 76-1184, page 2270), the National Bureau of
Standards published a notice of proposed interpretation of Federal Standard
COBOL as pertains to the evaluation of arithmetic expressions in the
COMPUTE statements. All comments submitted about the proposed interpretation have been duly considered.

The following approved interpretation contains a definition of the
problem, discussion of the issues, approved language interpretation,
necessary clarifications to Federal Standard COBOL, and the effective
date of the interpretation. The approved interpretation, as of the
effective date, becomes an integral part of Federal Standard COBOL and,
as such, is considered to be included whenever reference is made to
Federal Standard COBOL.

PROBLEM: There is no standard interpretation of the accuracy of the
arithmetic operations and the timing and scope of the ROUNDED phrase
among implementations of the COMPUTE statement. Both of these problems
involve intermediate results. This situation not only adversely impacts
the portability of COBOL programs, but also creates a major problem in
the development of test programs in this area.

ISSUES: The variations in the implementation of the COMPUTE statement
are due in part to the lack of specifications which address the following
issues in the Federal COBOL Standard:

    a. The number of decimal digits to be provided for intermediate
result fields.

    b. The behavior of the decimal point, if specified, in an intermediate
result field.

    c. The scope of applicability of the ROUNDED phrase in the COMPUTE
statement.

    d. Whether rounding or truncation will be applied to an intermediate
result field.

INTERPRETATION: This interpretation applies to both American National
Standard COBOL X3.23-1968 and X3.23-1974 as they have been adopted as
Federal Standard COBOL, FIPS PUBS 21 and 21-1, respectively. The inter-
pretation is in four parts. Each part addresses one of the four issues
related above.

    a. The size of the intermediate result field is implementor-defined.

    b. Decimal point alignment is required throughout the evaluation of
the arithmetic expression.

    c. The ROUNDED phrase in the COMPUTE statement applies only to the
assignment of the intermediate result field to the identifier to the left
of the equal sign. If the ROUNDED phrase is not specified, truncation, if
required, will apply to the assignment of the intermediate result field
to the identifier to the left of the equal sign.

    d. The implementor will define whether truncation or rounding will
occur on the intermediate result when it exceeds the size of the
intermediate results field.

DISCUSSION: The following discusses the rationale supporting each of the
four points in the interpretation.

    a. ANS X3.23-1968 (page 2-71, paragraph 5.1.3(5)) and ANS X3.23-1974
(page II-40, paragraph 5.1.3(5)) specify that "each implementor will
indicate the technique used in handling arithmetic expressions". This
specification is interpreted to mean the techniques defined by the
implementor include determination of the size of the intermediate result
field.

b. ANS X3.23-1968 (page 2-78, paragraph 5.4.4(1)) and ANS X3.23-1974 (page II-51, paragraph 5.3.4(1)) specify that "...decimal point alignment is supplied throughout the calculation". Decimal point alignment is therefore required throughout the development of the final result in the intermediate result field dependent only on the operands involved in an arithmetic expression.

c. ANS X3.23-1968 (page 2-76, paragraph 5.4.1) and ANS X3.23-1974 (page II-50, paragraph 5.3.1) specify that when rounding is requested (the presence of the ROUNDED phrase), the absolute value of the resultant-identifier is increased. Truncation will take place, as necessary, when the ROUNDED phrase is not specified. The standard does not specify or imply that the presence or absence of the ROUNDED phrase in the COMPUTE statement has any effect on the intermediate result field prior to the assignment of that field to the resultant-identifier.

d. The techniques defined by the implementor to be used in the handling of arithmetic expressions is interpreted to include the application of rounding or truncation to the intermediate result field.

CLARIFICATIONS TO THE FEDERAL COBOL STANDARD: None.

EFFECTIVE DATE OF THE INTERPRETATION: This interpretation is effective 30 days after publication in the Federal Register.

Approved: _____   SEP 3 1976

        Acting Director, NBS   Date

Disapproved: _____   _____

          Acting Director, NBS   Date